

# MEMORANDUM 01

**Project:** Hepburn Springs Pavillion  
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## RE: PAVILLION FLOORING PROPOSAL – HERITAGE VICTORIA QUERIES.

Hi Mark,

Further to our recent discussions, I understand that Heritage Victoria have asked two main questions with respect to the proposal to use a floor jack system in the Hepburn Springs Pavillion. Relevant responses to each question are provided below:

*1. Please provide structural engineering advice regarding the suitability or limitations of the proposed pedestal system for different loading scenarios, such as anticipated normal usage, or event with high attendance numbers.*

Loading is governed by AS1170 Table 3.1. See attached extract. From this information, the space could be used in several ways noted, ie: Occupancy C3, C4 or C5. The maximum potential loading to cater for is therefore a distributed live load of 5.0kPa, or a concentrated point load of 4.5kN.

### Flooring:

You've nominated James Hardie Secura Interior flooring under the selected flooring. 22mm Scyon should be used for commercial occupancies. The manufacturer's information for 22mm Scyon is provided below in Figure 01. You will see that the 5.0kPa noted above is catered for for both 450mm and 600mm spans. However, for the point load, even at 450mm span, the maximum design point load is 3.6kN. Even at 450mm span, this means that the users of the space need to provide additional spreaders across the span of the joists for uses where the point load exceeds 3.6kN. If the 600mm span is adopted, then additional spreading would be required for loading greater than 2.7kN. In either case, the users of the space need to be aware of the limitations of the floor system, or an alternative but similar product needs to be used that can cater for slightly higher point loads.

### Floor Framing:

The joists you've nominated are 150x50 C-channel joists. The joists required even for a 600mm span and 600mm spacing would be much less than this. For example the standard Elmich VF aluminium joist would be OK and its only 35mm high. Refer to Figure 02.

Consulting Civil &  
Structural Engineers  
Heritage Engineers  
Forensic Engineers  
Building Evaluation  
Expert Witness

**DIRECTOR:**  
David Hogg



For commercial applications, 22mm Scyon™ Secura™ Interior flooring sheets are structurally designed to withstand various loads categories in Table 3.1 of AS/NZS 1170.1 – Structural design actions – Permanent, imposed and other actions' for unfactored working stress loads stated in Table 2.

TABLE 2. MAXIMUM FLOOR JOIST CENTRES			
THICKNESS (MM)	JOIST CENTRE (MM)	POINT LOAD (0.01M <sup>2</sup> SIZE)	UDL ALLOWABLE
22	450	3.6 kN	5kPa
22	600	2.7kN	5kPa

Figure 01: Scyon load capacity product information

Looking at the Elmich information, there is no standard connection detail for a 150x50 C-section. It might be possible but need to check with manufacturer. Alternatively, could use a timber section or light guage galvanised steel SHS section. Timber would need to be Durability Class 2 probably – spotted gum or similar – and that will get expensive. So I think the standard aluminium system noted is probably best for detailing and durability.

	VersiFrame® 25F	VersiFrame® 35F
<b>Material</b>	Aluminium <sup>1</sup>	
<b>Linear thermal expansion coefficient</b>	2.34 x 10 <sup>-6</sup> K <sup>-1</sup>	
<b>Supply length (m)</b>	2.4	
<b>Height (mm)</b>	25	35
<b>Design span along joist (mm)</b>		
<b>Live load<sup>2</sup> @ 3.0 kN/m<sup>2</sup></b>	600	900
<b>Live load<sup>3</sup> @ 5.0 kN/m<sup>2</sup></b>	400	600
<b>Biological / Chemical resistance</b>	Unaffected by moulds and algae. Resistant to corrosion	

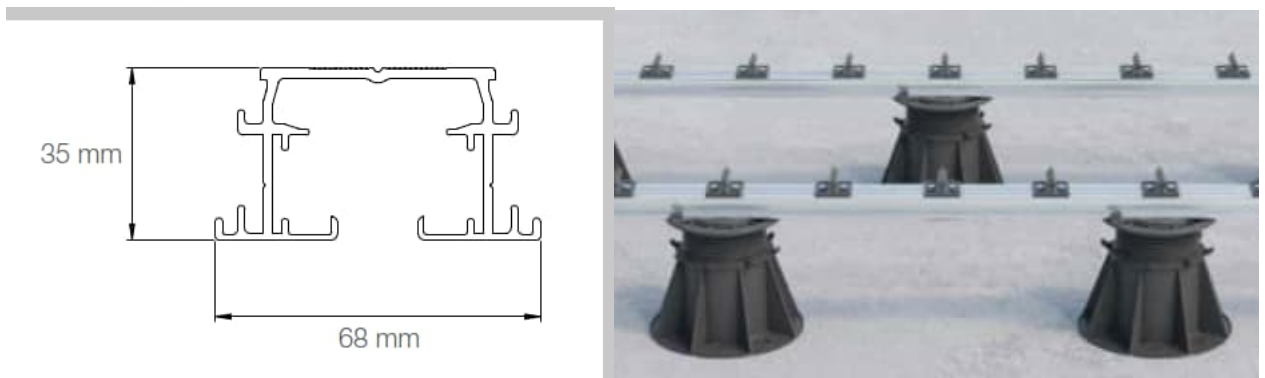


Figure 02: Floor joist data

### Jacks:

The range of heights available is shown in the attached product information extract in Figure 03. Elmich don't actually provide a vertical load capacity of the jacks that I could find, but given that they provide maximum spacing for bearers for commercial uses of 600x900, it is safe to assume that they can carry the required load. They are quite robust.



Type	Height (mm)	Pallet   Carton	Total Set
VJ - CT1	13 - 17	1   20	3600
VJ - CT2	17 - 26	1   20	2760
VJ - CT3	26 - 45	1   20	1800
VJ - CF1	37 - 50	1   20	1160
VJ - CF2	50 - 74	1   20	920
VJ - CF3	74 - 117	1   20	680
VJ - CF4	117 - 201	1   20	400
VJ - CF5	196 - 281	1   20	240
VJ - CF6	277 - 446	1   20	400
VJ - CF7	357 - 523	1   20	240
VJ - CF8	437 - 691	1   20	400
VJ - CF9	516 - 769	1   20	240
VJ - CF10	596 - 935	1   20	400
VJ - CF11	675 - 1014	1   20	240

*Figure 03: Available jack heights*

### Summary:

Based on the above:

1. Either use the jacks on a 600x600 grid with 22mm scyon flooring and ensure potential users of the building provide additional load spreading across the full 600mm span for point loading greater than 2.7kN, or;
2. As above but on a 450x600 grid with additional loading above 3.6kN, or;
3. As above but with an alternative but similar flooring capable of supporting the 4.5kN point load for a 600mm spacing between joists.

Option 1 seems like a reasonable compromise between cost and likely building use.

2. The Heritage Impact Statement outlines two options for resting the proposed pedestals on the original flooring:

Option A which involves resting the pedestal bases directly on the encaustic tile flooring, or Option B which involves layers of protection on top of the flooring that will also level out the space. In reviewing the options it would appear that option B is preferable given the additional protection it places on the original flooring when compared to option A, and some form of protection would be expected prior to installation of the proposed raised flooring. Please provide further information on which option is recommended to have the best long-term outcome for the original tiling, and the rationale for the recommendation.

On review of the proposal for Options A & B, both would appear to have potentially unfavourable factors.

Option A, direct support of the jacks on the floor, could damage the surface of the floor if placed directly on it. If this is to be adopted, some form of protective separation and load spreading mechanism should be provided. Clearly it is not desirable to provide any form of fixing of the jack to the existing flooring.

For Option B, my understanding is that the proposal to provide the packing sand and separation layer for Option B is to even out the floor to provide a level base for the jacks. This seems unnecessary as any level differences across the floor should be able to be accommodated by the height adjustment capability of the jacks. Additionally, it is understood that the subfloor can be subject to inundation when the creek floods. For this reason, the use of timber on the floor of the subfloor may allow this material to be wet for long periods. Despite the proposed ventilation and use of marine grade ply, this is probably not a good thing for the long term durability of the ply and may affect the quality of the air in the room. I suggest using a non-organic material to support the jacks such as CFC sheet.

Also for Option B, if the subfloor is inundated, compacted sand may lose strength and move around, causing level differences in the floor. These may be able to be corrected by further jack adjustments but that would have limits and should be avoided if possible. I don't think plain sand should be used and the use of other materials such as 3% cement stabilised sand or compacted crushed rock – both of which would be much more stable – could ultimately damage the tiles during compaction or if it has to be removed.

I think a hybrid solution is therefore better as per Figure 04, ie:

- Jacks to be set on the floor but directly supported on a 25mm CFC sheet bearing plate with a layer of resilient material between the packer and the floor – for example a thin rubber sheet that will not deflect noticeably under load and will provide protection and “cushioning”. An alternative might be to use a block of freezer panel closed cell foam similar to that used under freezer slabs etc.

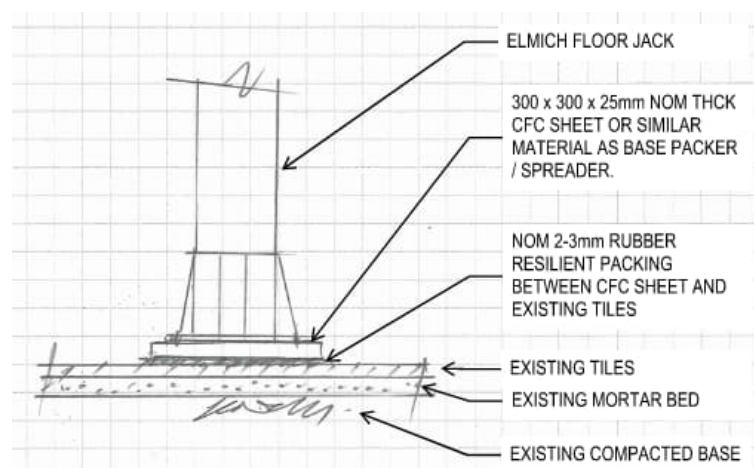


Figure 04: Suggested Jack base detail

Please call if you have any queries.

Yours faithfully

A handwritten signature in black ink, appearing to read 'David Hogg', written in a cursive style.

DAVID HOGG  
On behalf of Quatrefoil Consulting Pty Ltd

**TABLE 3.1** (continued)

Type of activity/occupancy for part of the building or structure	Specific uses	Uniformly distributed actions kPa	Concentrated actions kN
<b>C Areas where people may congregate</b>			
C1 Areas with tables	Public, institutional and communal dining rooms and lounges, cafes and restaurants <sup>(5)</sup>	2.0	2.7
	Reading rooms with no book storage	2.5	4.5
	Classrooms	3.0	2.7
C2 Areas with fixed seats <sup>(6)</sup>	Institutional assembly areas such as classrooms, lecture theatres and similar	3.0	2.7
	Public assembly areas such as public halls, theatres, courts of law, auditoria, conference centres and similar	4.0	2.7
	Places of worship	4.0	2.7
C3 Areas without obstacles for moving people	Corridors, hallways, aisles, stairs <sup>(2)</sup> , landings <sup>(2)</sup> , concourses, terraces, plazas, etc., not subject to wheeled vehicles	4.0	4.5
	Corridors, hallways, aisles, stairs <sup>(2)</sup> , landings <sup>(2)</sup> , etc. subject to wheeled vehicles, trolleys, etc.	5.0	4.5
	Footpaths, terraces and plazas at ground level subject to wheeled vehicles	5.0	31 <sup>(4)</sup>
	Museum floors and art galleries for exhibition purposes	4.0	4.5
	Balconies, and roofs used for floor type activities	same as areas providing access but not less than 4.0	1.8
C4 Areas with possible physical activities (see Note to Clause 3.1(b))	Dance halls and studios, gymnasia	5.0	3.6
	Drill halls and drill rooms	5.0	9.0
C5 Areas susceptible to overcrowding (see Note to Clause 3.1(b))	Assembly areas without fixed seating (concert halls, bars, vestibules, public lounges, places of worship, shopping malls) and grandstands	5.0	3.6
	Stages in public assembly areas	7.5	4.5
<b>D Shopping areas</b>	Shop floors for the sale and display of merchandise	4.0	3.6

(continued)